

### **ABSTRACT**

Ionisation of one of a pair of dopant atoms (11, 12) in a substrate (13) creates a double well potential, and a charge qubit is realised by the location of one or more electrons or holes (14) within this potential. The dopant atoms may comprise phosphorous atoms, located in a silicon substrate. A solid state quantum computer may be formed using a plurality of pairs of dopant atoms (11, 12), corresponding gate electrodes (22, 23), and read-out devices comprising single electron transistors (24).